500 feet, usually much nearer. It is undoubtedly an electric phenomenon, the exact nature of which is as yet completely unknown.

The calculation of the distance of an aerolite by allowing 1,100 feet for every second of time that elapses between its disappearance and the observed noise of the explosion is quite misleading. The noise originates at every point of the long path described by the aerolite as it rushes through the thin air overhead. A meteor may be in sight for ten seconds, moving majestically across the sky from one side to the other, describing in that time a distance of perhaps 200 miles, but the first sound that we hear comes from that part of the path that is nearest to the observer. Several other remarkable meteors, that is to say, shooting stars or aerolites, were observed during August in Georgia and Alabama, and are noted in the monthly reports of the sections.

Ball lightning is a rare phenomenon. Observers should be carefully on the lookout for it, but must not confound it with shooting stars or other phenomena.

HEAVY RAIN DURING HURRICANE AT PORT ROYAL, SOUTH CAROLINA.

The voluntary observer, H. D. Elliott, at Port Royal, S. C., reports through Mr. J. W. Bauer, Section Director, the following item with regard to rainfall attending the hurricane of August 30–31, 1898:

On the 30–31st a storm of considerable energy visited the section, reaching its height between 4 and 5 a. m. on the 31st. The maximum wind velocity was estimated to be between 60 and 70 miles per hour, from east to southeast. The precipitation of 10.82 inches during the twenty-four hours ending 8 p. m. on 31st exceeded by 5.89 any daily precipitation ever recorded, and the total of 24.68 for the month exceeded by 9.73 any previous monthly record.

WATERSPOUTS ON THE LAKES.

In 1889 the Editor had the good fortune to observe about twenty waterspouts one morning as the steamship *Pensacola* was sailing eastward on the southern side of an area of low pressure advancing northeastward toward Nova Scotia. Some account of these spouts was published in a Bulletin of the United States Eclipse Expedition to the west coast of Africa. It is not often that so many spouts are seen on one occasion, but records of five or ten occasionally come to hand. The following is condensed from an account by Capt. James Montgomery and First Mate J. E. Reynolds of the steamer *Kitty M. Forbes*, of their experiences on Saturday, August 13, on Lake Erie. The steamer was about 20 miles east of the Dummy going due east and expecting to touch at Ashtabula. About 8 a. m. a black cloud formed on the starboard quarter. It grew bigger and blacker and rose higher and higher, gaining on the ship and in a little while was off the bow. There was a fresh 10-knot breeze and the sun was shining as bright as could be on the vessel. Suddenly a portion of the cloud seemed to drop toward the water, dropping lower and lower while the surface water of the lake beneath it began to boil and whirl round and round and rise to meet the descending cloud. Then they came together and the cloud seemed to rise again. The spout appeared like a big cable 10 feet in diameter, connecting the great cloud and the lake. It was as black as the cloud. When we got nearer we found that the heavy mist surrounding the spout was descending water, falling like the spray from a fountain. The sun was shining and a rainbow was seen in the falling mists. Before long another part of the cloud began to descend and another section of the lake to boil and rise, and pretty soon there was another waterspout racing alongside of the *Forbes*, a bit closer than the first. The captain ordered on a full head of steam and sheered the vessel off to the northward. While the two black fellows raced along on the starboard side five more big columns of black water were waltzing and swaying along, and at the base of each pillar the surface of the lake was churned into a white foam. Sometimes the columns of water would move along as stiff and straight as a squad of soldiers, and again they would all begin to stagger and swing around in crazy gyrations. After a while the first waterspout began to disappear just as it had formed; the cloud of spray at that point settled lower and lower to the lake surface; then the lower part of the column separated from it and rose and the water once more became quiet. One by one they disappeared until suddenly we found that the biggest one of all having grown still bigger was dead ahead and near at hand. This one did not move as fast as the others, and we steered so as to leave it well to starboard. In an hour and a half after the first appearance the show was all over and the sky as clear as before.

Mr. Reynolds says: "Our greatest fear was that the spouts might collide and go to pieces, causing a sudden fall of tons of water upon the vessel." But so far as we understand the nature of the waterspout, the Editor sees no reason to apprehend danger from this source. A rather heavy rain will fall from the spray hurled up at the foot of the spout, but the spout itself is not made of solid water. It is primarily a cloud due to the low barometric pressure in the center of the whirling mass of air. There may be also a little spray sucked inward and upward. If the whirl ceases, the cloud disappears instantly, and the spray or rain that falls from it is not severe enough to do any injury to a well built vessel. There are many records of vessels that have run into such squalls. The wind may tear away a sail but the rainfall is not at all serious.

Our Great Lakes seem to be as subject to waterspouts as the warm waters of the Gulf of Mexico and of our Atlantic coast. The general explanation of the phenomenon of the spout is given in a very satisfactory manner in Professor Ferrel's Meteorological Researches Nos. I–III, and is reproduced in his recent advances. One of the best opportunities to photograph and measure a waterspout that has ever occurred took place in Nantucket Sound in August, 1896. Fortunately many photographs and descriptions were obtained and an elaborate study of this spout has been in progress in connection with the work of Prof. F. H. Bigelow on the reduction of cloud observations.

Other similar positive additions to our knowledge are very much desired and can be made by any observer who will secure photographs from several different points of view and especially accurate measurements of apparent angular altitudes and azimuths.

LUNAR RAINBOW.

According to the Daily Register of Mobile, a fine specimen of the lunar rainbow was seen at that place about 7:30 p. m. July 31. The full moon had reached an altitude of about 45° in the east and the rainbow was plainly seen on the dark bank of leaden clouds in the northwest.

The Editor is very much pleased with the calm, judicious, and dignified manner in which the Mobile Register recorded this interesting phenomenon. There was nothing sensational or extravagant in the description. There was not even a single error from a meteorological point of view; it was not called "a heavenly display," "a celestial visitor," "ball lightning," or "a direful portent." The proprietor of the Register, Col. John L. Rapier, evidently understands what is due to his readers in the way of good English and sound meteorology, and we could wish there were many more such.